EPA New England Office | Center for Environmental Industry & Technology

TECHNOVATION

CURRENT NEWS AND EVENTS ON INNOVATIVE ENVIRONMENTAL TECHNOLOGIES • VOLUME 2002 — 1

Where's the Money?

The Small Business Innovation Research Program (SBIR) is the only vehicle by which the Environmental Protection Agency (EPA) can give funds to businesses for research and development (R&D). EPA is a mission agency with regulatory responsibilities; therefore, the agency is not otherwise allowed to give R&D contracts directly to businesses. EPA New England's Center for Environmental Industry and Technology (CEIT) felt that the importance of SBIR in funding environmental technology research merited several Golden Opportunity Seminars and an updated SBIR Technovation. This issue of Technovation summarizes some of the presentations from past seminars, features three SBIR company success stories, and announces a unique opportunity.

The unique opportunity is the opening of three EPA SBIR Phase I Solicitations in 2002 for funding the investigation of the scientific merit and technical feasibility of proposed concepts. Solicitations for Mobile Sources and for Stormwater will open on January 21, 2002 and close on March 21, 2002. The third Solicitation will cover all remaining EPA topics and will open on March 28, 2002 and close on May 23, 2002. If you are considering applying for SBIR funding, this Technovation will give you a number of important tips that can help you develop a winning SBIR proposal.

Small Business Access to Federal Research and Development Funds

The Small Business Innovation Research Program (SBIR) was enacted in 1982 as part of the Small Business Innovation Development Act.

The purpose of the program is to stimulate technological innovation, utilize small businesses to meet federal research and development (R&D) needs and increase private sector commercialization. The program provides early-stage R&D funding directly to small technology companies or individual entrepreneurs who form a company. Small businesses must meet the following criteria to participate: (1) be American-owned and independently operated; (2) be for-profit; (3) employ no more than 500 employees; and (4) employ the principal researcher. Joint ventures and limited partnerships are eligible for SBIR awards, provided the entity created qualifies as a small business. Each year, the following 10 federal departments and agencies are required to reserve a portion of their R&D funds for awards through the program:

Department of Agriculture (USDA)

Department of Commerce (DOC)

- National Oceanic and Atmospheric Administration (NOAA)
- SBIR/Office of Research and Technology Application (ORTA)
- National Institute of Standards and Technology (NIST)

Department of Defense (DOD)

- Army
- Navy
- Air Force
- Defense Advance Research Project Agency (DARPA)
- Ballistic Missile Defense Organization (BMDO)
- Special Operations Command Center (SOCOM)
- National Imagery & Mapping Agency (NIMA)

Department of Education (ED)

Department of Energy (DOE)

Department of Health and Human Services (HHS)

- National Institute of Health (NIH)
- Center for Disease Control (CDC)
- Food and Drug Administration (FDA)

Department of Transportation (DOT)

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Innovative Solutions for Environmental Problems
EPA's Small Business Innovation Research (SBIR) Program

The Environmental Protection Agency (EPA) is one of 10 federal agencies that participate in the SBIR Program. EPA programs view SBIR technologies as a means of reducing pollution by providing lower capital and operational cost options and controlling pollution in more efficient and effective ways. Every year, EPA issues solicitations for Phase I and Phase II research proposals from science and technology-based firms. The solicitation is posted on the National Center for Environmental Research and Quality Assurance web site at **es.epa.gov/ncerqa/sbir**. The solicitation is also available by fax by calling the EPA SBIR Helpline at **1-800-490-9194**.

EPA programs view SBIR technologies as a means of reducing pollution by providing lower capital and operational cost options and controlling pollution in more efficient and effective ways.

Phase I of the program is designed to investigate the scientific and technical feasibility of technologies. EPA awards up to $100,000 and also provides free commercialization assistance during Phase I. The period of performance is typically six months. Approximately 10% of the applicants are funded.

Only Phase I winners are eligible for Phase II. Phase II is designed for prototype development/refinement and technology commercialization. Awards are usually $225,000 and up to $295,000 with a performance period of two years. An option under Phase II provides additional funding for the acceleration of commercialization as an incentive for third-party funding. Approximately 40% of Phase II applicants are funded.

How to win an SBIR award

Winning an EPA SBIR award requires preparatory work such as reading the solicitation, reviewing topic descriptions, searching the EPA web site for previous awards and clearly understanding the environmental problem. The next step is to build a team with which to brainstorm, plan and select an approach. Developing a quality proposal involves preparing an outline and a realistic workplan, emphasizing your strengths, showing the potential of your idea, providing a cost breakdown and describing a clear path to commercialization. This step includes clearly outlining the agency priority needs your technology addresses and the potential environmental benefits it should provide. A good proposal will contain key figures and tables, a third-party independent evaluation, letters of support and an excellent executive summary. Key figures and tables, specifically the pert chart and work plan, are essential because they help the reader to skim the proposal. They are always in the outstanding proposals. An excellent executive summary is particularly important because only three members of the External Peer Review Panel read the entire proposal. The other members receive the executive summary and a report with recommendations from the panel. The three members present the report to the rest of the panel and then answer questions. The panel then ranks the proposals. Only those proposals with ratings of "excellent" or "very good" are passed on to the EPA Relevancy Review Panel, which makes the final recommendations.

Developing a quality proposal involves devising an outline and a realistic workplan, emphasizing your strengths, showing the potential of your idea and describing a clear path to commercialization.

Other Options

Other agencies, such as DOD, DOE and NIH, have environmental topics in their SBIR solicitations. These agencies have much larger budgets and often will have two solicitations per year. Some agencies are willing to discuss the topics with companies prior to the solicitation and may be open to suggestions for future topics. Also some of the larger agencies, such as DOD and NIH, are testing a fast-track approach for proposals which shortens the approval process and provides funding sooner.

Summary of presentation by Jim Gallup, Ph.D., Director of the EPA SBIR Program.

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Maximizing SBIR Success by Utilizing Other State and Federal Programs

Understanding the Phase Structure of the SBIR Program

Phase I is a proof of concept phase that establishes the feasibility of the project. You have to win here to be eligible to compete for Phase II. Up to $100,000 is available in Phase I, depending on the agency, to demonstrate the innovativeness of your technology, its importance, and its commercial potential. Phase II, worth up to $750,000, again depending on the agency, is to develop the concept to the prototype stage. To successfully win this phase, a solid R&D plan needs to be clearly articulated, the market identified, and your knowledge, commitment and ability to commercialize demonstrated. Phase III is the ultimate goal—commercialization.

Agency Differences

It is extremely important to know the differences between agencies. First, the dollar amount for each phase is different. Second, the mission of each agency is different and therefore so are each agency's research objectives. Third, the type of review process is different—peer review vs. line review.

Peer review – in peer review there are external reviewers, usually looking for the development of great technologies. Agencies that utilize peer review are: USDA, HHS, ED, NSF, and EPA.

Line review - this is used by agencies looking for a product to meet their needs at the end of the process. Agencies that use line review are: DOC, DOD, DOE, DOT, and NASA.

Optimize your chances of winning. Your technology may be of interest to more than EPA. Scan all agencies for research topics where your technology/research effort could apply. For most agencies, the research topics are listed in Section 8 of the solicitation. EPA does not fund the design and development of prototypes, only the construction and testing of prototypes as designed.

The SBIR/STTR program provides more than $1 billion in R&D funding annually for small businesses. It provides funding for *high risk* ideas and solicits a wide range of topics.

What are the Program Advantages and Benefits of the SBIR/STTR Program?

The SBIR/STTR program provides more than $1 billion in R&D funding annually for small businesses. It provides funding for *high risk* ideas and solicits a wide range of topics. It enables the development of a technology base. The program leaves patent and proprietary rights with small businesses. It requires no repayment of the money received and requires no equity sacrifice.

However, the SBIR/STTR programs are highly competitive, requiring excellence in all aspects of the competition process. A commitment to win the competition is essential, even if the first attempt is unsuccessful. If the first proposal is unsuccessful, the agency will provide comments. With those comments incorporated, the chances of winning a resubmission is increased significantly.

Problems Typically Encountered

There are a number of general reasons why proposals are rejected. One reason is the lack of a technically sound concept and/or logical approach to the project. Two is a failure to demonstrate knowledge of technical field (what is the current state-of-the-art), the market potential, and the impact of the idea on society (the big picture). Third is the submission of a budget that is not in accordance with government accounting regulations. Fourth is the absence of a description of how the management team will commercialize the product, particularly in Phase II. Fifth and probably the most common reason is a failure to follow directions for preparing and submitting the proposal!

SBIR proposals are unique, requiring different proposal writing skills. Applicants must be able to write technically so nontechnical people understand (line review) or to write technically so technical people not strong in the applicants' discipline understand (peer reviews).

The good news is that support is available through Small Business Development Centers (SBDC), Manufacturers Extension Partnership, SCORE, Procurement Technical Assistance Center (PTAC), state economic development districts, university industrial cooperation offices, state financial support programs for early seed capital/loan investments and industry and trade organizations.

Summary of presentation by David Patch, a regional SBIR expert.

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Proposal Preparation for SBIR

Before You Write - Thinking About Applications

Before writing a proposal, think about who might need your technology. Ideally you want to have both a government user and a commercial user in mind. The way these people will use the technology is called an application for the technology.

Applications are built around the needs of users. They are context bound. The engineering specifications and other characteristics of your technology must meet these needs as well as comply with any relevant regulations and/or standards and certification requirements (i.e., UL for electric consumer products). The following are sources of information on standards, certification and regulations:

- American National Standards Institute: **web.ansi.org/public/library/internet/resources.html**
- International Organization for Standardization: **www.iso.ch/VL/Standards.html**
- American Society for Testing and Materials: **www.astm.org/**
- International Directory of Testing Laboratories (Directory can be searched by geographic location, lab name, subject area, or keywords) **astm.org/labs/index.html**
- U.S. State & Local Gateway of National Performance Review: **www.statelocal.gov/**
- Federal Web Locator of Center for Information Law and Policy: **www.infoctr.edu/fwl/**

Applications are also time bound. The year of commercial introduction is not necessarily the current year. The requirements and traits that embody end-user needs may change over time so you may have to design your project to "hit" a moving target.

With the applications in mind, find a topic in an agency solicitation under which you can submit a proposal. In choosing an agency and topic in which to compete, remember—programs and topics with growing funding are better targets than those that are shrinking—more money. New programs or topics are better targets than established programs—no established competitors to knock out. Topics addressing high priority problems are better targets than programs that do not—they need a solution so they are willing to try innovative solutions. Topics which do not describe a design for the technological solution are better targets if you are developing a product but worse if you are developing a process—you have to know what you will build before you worry about building it more efficiently.

Writing the Proposal

Now you are ready to write. There are three themes behind successful SBIR/STTR proposals. These three themes can be mapped into the proposal.

Proposal Significance

What is the significance of the problem? What problems are you going to solve and for whom? What are you going to produce? What difference will your effort make to them?

Proposal Technical Objectives

How are you going to go about resolving the problem identified above? What are your specific technical objectives and how do you intend to demonstrate their feasibility? What are the details of the work plan for accomplishing the objectives?

Proposal Outline

Background/Work Plan: What are the scientific/technical quality, the innovativeness and the originality of the proposed project? This issue is seldom addressed in a distinct part of the proposal. Rather, you should keep your attention on this issue throughout the proposal.

Staff, Facilities and Equipment: Why are you the right firm to perform the work? What evidence can you provide to establish your firm's credibility including your awareness of the state-of-the-art, your firm's previous experience in conducting related research and development and the qualifications of key personnel, consultants and your facilities?

Some Hints!

Create check lists. This applies to proposals and to performance. At the beginning of the program, make check lists. During the work effort, check items off the lists. Before delivery, check all lists, and then deliver a complete and correct product. Here are some things to include in your check lists: Does the content violate laws of physics, economics or common sense? Is the math correct? Are your cost tables correct? Have you edited the proposal for spelling, grammar, clarity, etc.? Are there any blank page errors, incomplete and/or inconsistently labeled charts and is the pagination correct? What did independent reviewers say about your proposal (after all, you are to close to it to be objective)?

Make the proposal look good! When you are writing, ask yourself, "Who am I writing for?" and "Can I listen to this proposal if it is read aloud?" Think about graphics. Ask, "How can this information best be grasped - through graphics?" Also ask, "Will graphics cut down the length of my proposal?" Remember your reviewer will have a stack of proposals on the desk.

Get a debriefing. Always debrief if you lose so you can do better next time. Decide in advance whether you are likely to appeal. Request debriefings in writing and highlight in your request any specific information you want to know. Request a debriefing by technical personnel. Before the debriefing request copies of all reviews and be familiar with them. Make debriefings a key part of your marketing strategy.

Summary of presentation by Phyl Speser, J.D., Ph.D., a nationally known SBIR proposal preparation expert and an SBIR multiple award winner.

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Proposing SBIR: From Thought to Bought

There are **three keys to writing a good proposal** which are patterned after Weinberg's Element of Technical Innovation (Weinberg, 1986). **The first key is understanding the problem.** This will require you to read the specifications, review the state-of-the-art, consult with the independent experts, talk to the topic sponsors and contact the end-user. Look for high priority topics. **The second key is managing the flow of ideas.** This involves building a team and enlisting the experts without necessarily becoming one. **The third key is maintaining quality.** The proposal is your first "product." It is important to secure resources necessary to do the work, monitor progress, manage customer expectation and deliver a quality product.

Ingredients of a Winner

You must clearly understand the customer's requirements. Broaden your capability. Only true genius works in isolation; for the rest of us collaboration is key. Show the potential of your ideas and a clear path to commercialization. It is okay to go out on a limb and over commit yourself. Most of all —DON'T QUIT; learn from losing.

The Elements of a Phase I Program

Your technology must be a new approach. You must demonstrate the capability and the resources of the team. Show clear cost and performance benefits if the project is successful. Identify main risk areas. Phase I is a time to show proof of principle and to reduce risks. Make sure your scope of work is realistic. Request a maximum dollar amount to go farther faster. Get an independent evaluation. Make sure your project ties to a major agency program. A key to getting Phase II funding is to deliver a "touchy-feely" at the end of Phase I.

Writing the Phase I Proposal

Read the instructions. Visualize the proposal flow. Determine the content of the illustrations. Do an outline or story board and then write the sections out of order. As a general guideline, the Intro/summary should be about one page; Phase I technical objectives, one page; Phase I work plan, three to four pages; Commercialization plan, one page; and Identification and significance of the problem or opportunity, four to five pages. Eliminate repetition. Format attractively. Leave time for critical review. Remember that **a good proposal skims easily but withstands thorough critical review**. In light of this, make sure to include the following key figures and tables: a concept diagram; a performance comparison; a program schedule; and, milestones. Letters of support also go a long way.

Summary of presentation by Jack DeMember, Ph.D., Business Development Manager of Foster-Miller, Inc. Foster-Miller, Inc. is a multiple SBIR award winner.

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Small Business Access to Federal Research and Development Funds

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Environmental Protection Agency (EPA)
National Aeronautics and Space Administration (NASA)
National Science Foundation (NSF)

SBIR is a highly competitive three-phase award program. Phase I is a feasibility study to evaluate the scientific and technical merit of an idea. Phase II is to expand on the results of and to further pursue the development of Phase I. Phase III is the commercialization of Phase II results and requires the use of private sector or non-SBIR federal agency funding.

The Small Business Technology Transfer (STTR) Program was established by Congress in 1992. Five federal agencies with R&D budgets over $1 billion conduct STTR programs: DOD, DOE, HHS, NASA and NSF. The program is similar in structure to SBIR but funds cooperative R&D projects involving a small business and a research institution (i.e., university, federally-funded R&D center or nonprofit research institution).

The purpose of the program is to stimulate technological innovation, utilize small businesses to meet federal research and development (R&D) needs and increase private sector commercialization.

A program solicitation is produced annually for both SBIR and STTR. These solicitations open on the release dates and contain deadlines and target dates. The solicitations are publicized by the Small Business Administration, announced in the Commerce Business Daily, sent to NSF's small business mailing list and placed on the agencies' web sites.

How to Write a Competitive Proposal

As you prepare to write your SBIR proposal, there are some things you should keep in mind about the proposal review, grading and selection process. Proposal reviewers are a heterogenous group of people. They have personalities, other jobs and interests, objective capabilities, subjective feelings, moods, etc. Evaluators have varying reading habits:

- Conscientious reader 30%
- Skimmer 30%
- Peruser/Reader's Digest 30%
- Critic 10%

Therefore, it is important to make their job as easy as you can. Work on the quality appearance of your proposal. Write a proposal that holds interest and is easy to read. Do not make the reviewer dig for information; highlight key issues and use pictures, tables and figures.

Abstract

The abstract should identify the problem and your solution to the problem, and describe why the solution will work, plans to demonstrate the solution and the benefits to be derived. Here is an example of an abstract:

Plastic media blast (PMB) is rapidly growing as a coating removal method because it does not damage composite or soft metal surfaces when compared with the effects of chemical stripping solvents or hard abrasives (i.e., sand). However, the conventional PMB materials are all highly resistant to biodegradation. A commercially available, biodegradable plastic known as PHBV® and manufactured by Imperial Chemical Industries, is proposed as a biodegradable plastic media blast (BPMB). This new class of biodegradable polymers has several unique features which make it an ideal candidate as a BPMP: (1) microorganisms rapidly biodegrade it to CO_2 and water, (2) it is not affected by water or humidity like starch-blast media, (3) like conventional thermoplastics, it can be melted, molded, or extruded, and (4) different hardness characteristics can be engineered into the polymer formulations. Lynntech, Inc. has outlined a comprehensive Phase I project for conversion of raw PHBV® into 20-30 mesh abrasive, testing and evaluation of coating removal characteristics using established procedures for PMB application, documenting biodegradation features, and performing a cost analysis. This will form the basis for transitioning this new material to commercial production and application.

Write a proposal that holds interest and is easy to read. Convince the reviewer that you are the best qualified to carry out the project.

WHAT: Identification and Significance of the Problem

Revisit the problem and introduce the basis for innovation (solution). Explain how solutions logically merge with the problem. Introduce an overview of the Technical Objectives. Discriminator: Boldface one or two thoughts you really want to impress upon the reviewer. **Do all this on the first page**.

WHY: Background

Develop the framework for merging the innovation with the problem to provide the solution. Explain the problem and the innovation in detail. Develop the premise of why your innovation will work. Discriminator: Explain how you have positioned yourself using preliminary work or data to start "ahead" of this project.

Describe who/what will benefit from the success of your work. Develop either a general or specific pathway to commercial use.

HOW Part I: Technical Approach

Walk the reviewer through the project in general terms. A drawing or diagram of the project components is extremely helpful. What is stated in the work plan (tasks) will track with specific objectives.

HOW Part II: Technical Objectives - Tasks

Identify tasks or steps needed to demonstrate the innovation and how it applies to the solution. When giving task description, give the reviewer a guided tour of exactly (step by step) what you plan to do to accomplish each task. Do not leave any room for assumptions. Use recognized procedures or standard methods where possible; this establishes credibility. Be sure the work outlined answers the questions but is not impossible to accomplish.

WHEN: Schedule

The objective of the schedule is to demonstrate that thought and planning have been directed toward the project. Be sure that the schedule is directly related to tasks. Strive for quick startup. Show a logical progression of events vs time. Be reasonable; build in time for Murphy's Law. Discriminator: This is the key place where you set in the reviewers mind that: (1) You have a logical, realistic plan and (2) You can pull it off.

The abstract should identify the problem and your solution to the problem, and describe why the solution will work, plans to demonstrate the solution and the benefits to be derived.

Commercial Potential

Describe who/what will benefit from the success of your work. Develop either a general or specific pathway to

commercial use. Provide cost analysis data that have solid data for the conventional technology(s) and provide an estimate of how the new process costs-out. Introduce future plans by including an outline of where you go after this project and a plan for how you will interface with your industry partner.

Key Personnel

Provide qualification and related work experience for the principal investigator (P.I.). Convince the reviewer that you are the best qualified to carry out the project. Involve one or more expert consultants in your project. Identify and obtain support from an industrial partner.

Equipment/Instrumentation and Facilities

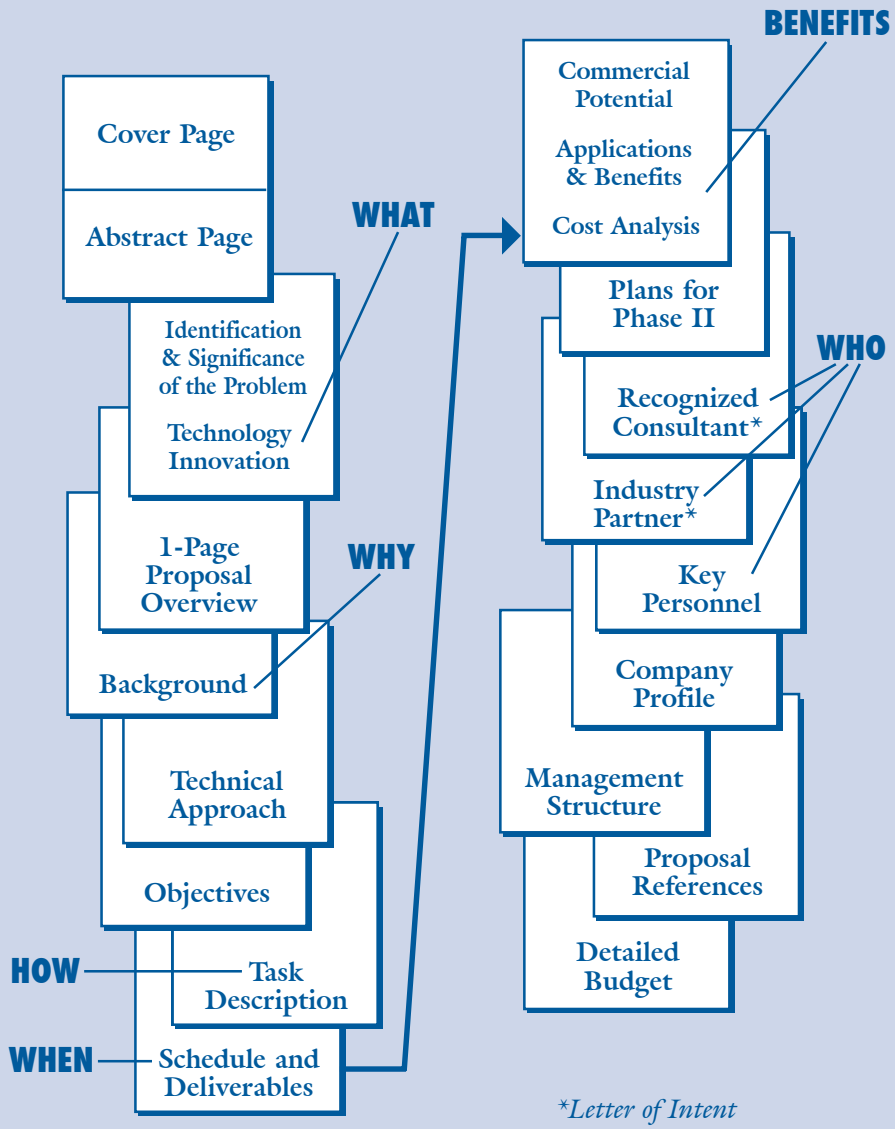
Briefly describe all equipment and instrumentation that is available to support this project. If analytical work or other tests are performed outside, tell who and where. Describe facilities where project will be carried out. Show how you fit in the management structure if necessary.

> The proposed budget for accomplishing your research plan must be realistic. All direct cost items must be justified.

Proposal Budget

The proposed budget for accomplishing your research plan must be realistic. Include one month of P.I. time on Phase I, two months on Phase II. Also include adequate man-hours of engineering and technical personnel. You must establish engineering Overhead rate and G&A rate. All direct cost items must be justified. Travel must be directly related to carrying out the project. You must demonstrate the ability to capture direct and indirect costs as they occur (time sheets and purchase orders). An accounting system appropriate for government contracts must be in place before a Phase II award can be made. Keep in mind that pre-award and post-awards audits are likely to be made.

Key Elements of an SBIR Proposal



Proposal Preparation Schedule

Most successful proposals are written with a timetable or schedule. Provide sufficient time to think the project through and adequately research background. Develop and rework research approach. Define technical objectives and develop work plans that adequately satisfy technical objectives. Prepare a complete draft of the proposal and leave it for a few days. Then review the proposal and make changes that will give rise to significant improvements. You are now ready to prepare the final draft and submit the proposal.

From handout created by Oliver J. Murphy, President of Lynntech, Inc. Lynntech, Inc. is a multiple SBIR award winner.

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SBIR Program Success Stories

The following are the success stories of three New England companies that received EPA SBIR Phase III contracts. The Phase III projects were funded as part of the President's Environmental Technology Initiative (non-SBIR funding). The technologies, briefly described in this section, hold great promise for future environmental benefits. These companies demonstrated the technical feasibility and commercialization potential of technologies that could benefit the public and further the Agency's mission. These companies are: **Niton Corporation,** Bedford, Massachusetts; **Oxley Research, Inc.,** New Haven, Connecticut; **Precision Combustion, Inc.,** New Haven, Connecticut.

Oxley Research, Inc.

Oxley Research Inc. (ORI), located in New Haven, Conn., has developed a new, environmentally beneficial, cost-saving process for the online electrolytic regeneration of acid cupric chloride—an etchant used in the fabrication of printed circuit boards. **ORI**'s innovative process maintains solution etching power and recovers a high grade of easily sold copper metal, similar to "cathode copper."

Under Phase II, **ORI** successfully demonstrated a pre-prototype version of the process. Phase III focused on improving the process and designing a 2.5 kg/hr engineering prototype for operation in conjunction with commercial spray etchers. That unit was constructed and is being evaluated for future commercial application.

Environmental Significance

ORI's technology replaces widespread chemical regeneration, which typically involves the use of sodium chlorate/hydrochloric acid or hydrogen peroxide/hydrochloric acid. By eliminating use of these chemicals and the generation and disposal of about four to five gallons per day of excess etchant per gallon of etchant inventory, **ORI**'s process offers substantial environmental incentives and potential cost reductions for the printed circuit board fabricator. Hydrochloric acid is regulated as a hazardous air pollutant (HAP) under the Clean Air Act. Exposure to hydrogen peroxide and hydrochloric acid may cause damage to the eyes, skin and respiratory system.

ORI's process offers substantial environmental incentives and potential cost reductions for the printed circuit board fabricator.

The **ORI** process also offers significant improvements over previous attempts to electrolytically regenerate acid cupric chloride. Its advantages include avoidance of chlorine evolution, production of monolithic copper deposits, and low power operation.

Impact of Commercial Success

EPA's support of this technology through the SBIR Program has enabled **ORI** to obtain additional funding for its commercialization from the NIST/DOE Energy Related Inventions Program (ERIP) and the State of Connecticut. Also, through other SBIR awards, **ORI** has expanded this etchant regeneration technology beyond printed circuit boards to include lead frame etching.

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NITON Corporation Detects Lead On-Site *In Situ*

NITON Corporation, located in Billerica, Mass., has developed several XL Series Spectrum Analyzers to measure up to 25 different elements in soil, paint, dust wipes and filters. **NITON** has a patented portable detection system, which uses x-ray fluorescence (XRF) of elements coupled with microelectronics and a solid state semiconductor detector to detect lead and other elements. At the completion of the SBIR Phase II cycle, **NITON** had developed an instrument capable of detecting deeply buried and layered lead in paint as well as surface lead. In Phase III, **NITON** focused on completing a dual-detector instrument that would give better performance and reduce detection limits of the current lead and multi-element analyzers. The dual-detector instrument analyzes lead and up to 17 other elements in less than a minute. Subsequent innovations have enabled enhanced versions of these instruments to quantify all eight RCRA metals in-situ.

The NITON XRF was able to take up to 100 samples a day and analyze the samples at a significantly lower cost than conventional analysis.

Environmental Application

The **NITON** analyzers are capable of measuring lead contamination in paint, soil and dust wipes. An example of this technology's application is illustrated in a recent lead abatement project conducted by Fuss & O'Neil. The site, located in a rural area in western Connecticut, was a rifle and handgun firing range, which was under agreement for sale if the lead contamination could be removed prior to a pre-set closing date. The site had approximately 270 tons of lead contaminated soil. The project manager was able to rapidly identify "hot spots" of contamination with the **NITON** XL-700 Series analyzer.

The State of Connecticut required that lead be removed to below 500 ppm in soil and have a mobility criterion of less than 0.015 ppm. The initial challenge for the contract engineers, Fuss & O'Neil, was gaining state approval for the use of the **NITON** XRF. To accomplish this goal, Fuss & O'Neil took 21 soil samples at the site and had confirmatory laboratory analysis performed. This gave the state confidence in the **NITON** analyzer's precision and accuracy for identifying lead contamination on-site. The technology was, therefore, used as the primary decision-making tool to evaluate the site and to provide "real-time" measurements for the remediation activity. The **NITON** XRF was able to take up to 100 samples a day and analyze the samples at a significantly lower cost than conventional analysis.

NITON XL Spectrum Analyzer, a field portable fluorescence analyzer.

INEEL found NITON's dual-detector analyzer of high quality and able to measure lead in paint and other elements within minutes saving significant costs during paint removal activities.

Verification Studies

The evaluation of **NITON's** lead analyzer by the Connecticut Department of Environmental Protection is one of several that have been conducted since 1994. An evaluation performed by the Idaho National Environmental Evaluation Laboratories (INEEL) found **NITON's** dual-detector analyzer of high quality and able to measure lead in paint and other elements within minutes saving significant costs during paint removal activities. A video illustrating this evaluation is available through INEEL or **NITON**. The **NITON** Corporation has also participated in the Environmental Technology Verification (ETV) program. The report can be obtained from EPA's web site at **www.epa.gov/etv**.

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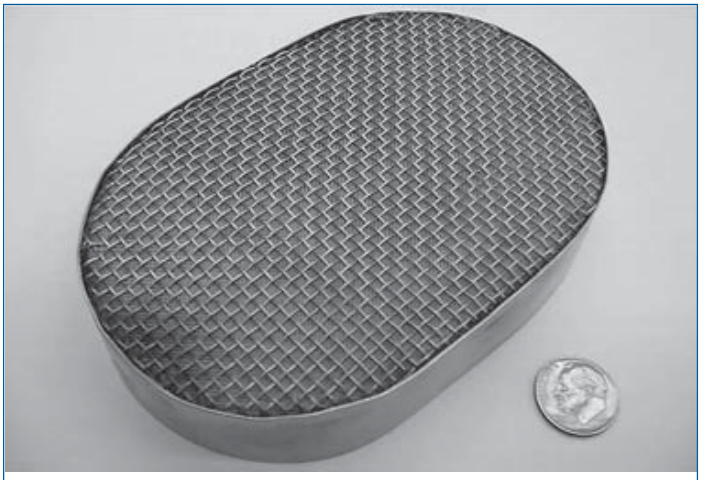
Precision Combustion, Inc.

Precision Combustion, Inc. (PCI) of New Haven, Conn., has developed a lightweight, highly efficient Microlith® catalytic automotive pre-converter based upon a novel reactor engineering design. It is a fast lightoff catalytic device capable of significantly reducing automotive emissions when placed in an automotive exhaust system upstream of a conventional catalytic converter. Research funded by EPA has resulted in successful concept feasibility testing and technology demonstration, as well as significant progress in prototype manufacture and pre-commercialization trials with automakers and Tier 1 automotive suppliers. Additional applications for the technology are being developed for marine 4-stroke engine, heavy-duty natural gas IC engine, and small 2-stroke utility engine emissions reduction.



Precision Combustion, Inc.'s lightweight, efficient automotive pre-converter.

Environmental Significance

PCI's pre-converter, used with a conventional main converter, offers a simple and durable solution to reducing cold start emissions. The technology will enable automakers to equip light-duty vehicles, at reasonable costs, with emission systems that meet the Ultra-Low Emissions Vehicle (ULEV) standards required for the cleanest segment of their fleets, as mandated by the new National LEV program. The National LEV, or the "Voluntary National Low Emission Vehicle Program for Light-Duty Vehicles and Light-Duty Trucks," applies to 1999 and later model-year light-duty vehicles to be sold in the Northeast Trading Region, and 2001 and later model-year light-duty vehicles to be sold throughout the United States. ULEV emission standards for a light vehicle certification have been established at levels not to exceed (@50,000 miles, in g/mile): CO (1.7), NMOG (non-methane organic gases) (0.04), NOx (0.2) and formaldehyde (0.008).

PCI's pre-converter, used with a conventional main converter, offers a simple and durable solution to reducing cold start emissions.

Through EPA support, **PCI's** technology has evolved via a number of crucial Federal Test Procedure (FTP) and New European Driving Cycle (NEDC) automotive tests at major U.S., Asian and European automotive companies and at their Tier 1 supplier test facilities.

Impact of Commercial Success

PCI was founded in 1986, and has grown since its first EPA funding from four employees to 40 employees. **PCI** has developed a broad-based, world-leading technology in the core areas of ultra-low NOx gas turbine catalytic reactors for exhaust aftertreatment, fuel cell systems, and chemical processes. PCI is now working to commercialize its technologies through industrially funded strategic alliances with major manufacturers. **PCI** product development has been supported by a combination of government R&D contracts, direct major manufacturer investment and equity investment.

PCI was founded in 1986, and has grown since its first EPA funding from four employees to 40 employees.

PCI's success has been recognized through various awards, such as the "Tibbetts Awards" in 1998 from the Office of Technology, U.S. Small Business Administration, in recognition of its unique contributions as a "Small Business Innovation Research Model of Excellence." Other awards include selection as one of five for the 1998 Environmental Technology Innovator Award by EPA New England and selection by Deloitte & Touche as one of the fifty fastest growing high technology companies in Connecticut for the last three years in a row.

PCI is now working to commercialize its technologies through industrially funded strategic alliances with major manufacturers.

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Commercializing Technology

Goals/Capabilities

The first step to commercialization is thinking about your goals and capabilities. Why do you want to commercialize? Is it to make money? Do you have other goals of success, such as prestige or publications? These goals can be translated into clear objectives for future negotiations. In setting objectives, it helps to distinguish among must-have items, like-to-have items and no-way items. The first set enables you to meet your goals. If someone offers them to you, take them. Everything else is nice to have and sweetens the deal. Of course, avoid the no-way items. Now

The first step to commercialization is thinking about your goals and capabilities. Why do you want to commercialize?

review these goals to bring them into coherence with your firm's business strategy, positioning and capabilities. Remember that you must have something to sell. You must be able to complete R&D, design the product, complete production engineering, produce the product, support it and distribute it. If you do not have all the capabilities and resources needed to get the product or service to market on your own, partnering for these capabilities and resources is probably going to be a key part of your goal for commercialization.

Your Technology

The second step in commercializing is to figure out who will buy your technology. To do so, you must find where the performance and characteristics of your technology intersects with the needs of end-users. You must make it cheaper or easier for the users to do their job or make it possible for them to sell something new or more of what they already sell. In short, if the users cannot have a better life or make money from your technology, why buy it? You can find out about needs through web searches, traditional library literature searches, contacting associations and requesting road-maps or other authoritative statements of their members needs or by interviewing

You must make it cheaper or easier for the users to do their job or make it possible for them to sell something new or more of what they already sell.

experts. Also important is to understand the standards, certifications and government regulations the users will expect your technology to meet or comply with.

Market Conditions

The third step is to investigate market conditions. What technology will you compete against? What firms? How do firms who sell to end-users compete in the industry? How do firms who will be vying with you to sell technology to the firms that manufacture and distribute products for and to the end-user compete? To find

You must be able to complete R&D, design the product, complete production engineering, produce the product, support it and distribute it.

out about technology, look at: (1) patents (**www.uspto.gov**), (2) federal research and development projects, (3) scholarly literature, (4) news groups, (5) list servers, (6) conferences/symposia and (7) preprint repositories. To evaluate the size, structure and dynamics of the market, contact: experts; associations; leading firms competing in the market; and, web services like Electric Library and Dialog. Find a market where you think you can successfully compete.

Doing Deals

Now you need a partner to help you commercialize the technology. Usually this will be a major corporation, but it also can be another small company, a venture capitalist or angel, or even a state agency funding high tech economic development or environmental projects. When you talk with your targets, in order to better plan and move to a deal, ask the following kinds of questions:

What technology will you compete against? What firms? How do firms who sell to end-users compete in the industry?

Who are the decision makers? How long is the decision process? Who will be involved and in what roles or functions? What criteria will be important and why? What specific information will be desired? Are their models or examples of deals that the target has made in the past?

Summary of presentation by Phyl Speser, J.D., Ph.D., a nationally known SBIR proposal preparation expert and an SBIR multiple award winner.

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Matrix of Characteristics of Federal Agency SBIR Programs

	USDA	DOC		DOD	
		NOAA/NIST	Air Force	Army	DARPA
Contract vs Grant	G	C	C	C	C
Maximum Phase I Amount	$80k	$75	$100K	$70/120k	$99k
# of Phase I Awards	90	40	350	200	100
Maximum Phase II Amount	$300k	$300k	$750k+	$730k/750k+	$750k+
# of Phase II Awards	35	20	250	100	45
Profit/Fee Allowed	Y	Y	Y	Y	Y
PhaseI/II Gap Funding	Y	N	Y	Y	Y
# of Solicitations per Year/# of Due Dates	1/1	1/1	1/1	1/1	2/2
Solicitation Access: Electronic or Paper	E, P	E	E, P	E, P	E, P
Electronic or Paper Proposal Submission	P	P	P	E	E, P
Dept. $s Possible for Phase III	N	N	Y	Y	Y
Renewal Required to Stay on Mailing List	Y	N	Y	Y	Y
Advanced vs Progress Payments	A or P	P	P	P	P
Phase III Funding Precommit Required	N	N	Fast Track	Fast Track	Fast Track
% PI's Time Required with Firm	51%	51%	Negot	Negot	51%
Open Ended (Broad) Topics	Y	Y	N	N	N
Solicitation Open Date	June	Oct	Oct	May	Dec/May
Solicitation Close Date	Aug	Jan	Jan	Aug	Jan/Aug
Notification Date	Mar	July/Sept	May	Nov	Mar/Oct
Contact OK w/ Tech Rep When Solicit Out	Y	N	N	N	N
% Phase I Applications Awarded	18%	10%	12%	9%	25%
% Phase II Applications Awarded	50-60%	30-50%	50%	53%	45%
Debriefing Request: Oral or Written	Auto	W	W	W	W
Debriefing: Oral or Written	W	W	W	W	W

About CEIT

EPA's Center for Environmental Industry and Technology (CEIT) continues to move forward with our mission to promote New England's environmental technologies. We have embarked on numerous programs and projects designed to sustain the strength of the environ mental industry, make it easier to commercialize new technologies, provide more flexibility for environmental technologies buyers and reduce costs for the regulated community. CEIT acts as a point of contact for the environmental industry, technology developers, investors and other interested stakeholders, providing an ombudsman service for those seeking assistance on the development of new technologies. The following are highlights of our services:

Golden Opportunity Seminar Series

Through this series, participants learn about technology transfer; assistance and verification opportunities; and financing opportunities.

Technology Trade Shows

Technology Trade Shows showcase new and innovative technologies. CEIT is now featuring web-based or "virtual" trade shows focused on decentralized wastewater and storm water technologies.

Innovative Technology Inventory

This web-based database contains information on descriptions, applications, performances, limitations, and costs of innovative environmental technologies.

Technovation

CEIT's technical bulletin highlights promising technologies developed by New England companies and provides information on important issues.

Ombudsman Hotline

CEIT offers assistance, information, and referrals on a wide range of federal and state programs to the industry through its Ombudsman Hotline: **1-800-575-CEIT**.

CEIT HomePage

A visit to our Home page at **www.epa.gov/region01/steward/ceit** will give you up-to-date information on business opportunities, upcoming events, links to other web sites of interest to the envirotech industry and access to the Virtual Trade Shows and the Innovative Technology Inventory.

	BMDO	Navy	ED	DOE	HHS	DOT	EPA	NASA	NSF
	C	C	C	G	C	G	C	C	C	G
	$65k	$70/$100k	$60K	$100k	$100k+	$100k+	$100k	$100k	$70K	$100k
	167	223	55-61	215	28	963	20	40	300	212
	$600k/750k	$600k/750k	$300k	$750k	$750k	$750k+	$750k	$225k/295k	$600k	$500k+
	69	191	10-15	90	18	266	10	10	100	108
	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Y	Y	N	N	N	Y	N	N	N	N
	1/1	2/2	1/1	1/1	1/1	1/3	1/1	1/1	1/1	2/2
	E, P	E, P	E, P	E, P	E	E	E	E	E	E
	E, P	E	P	P	P	P	E, P	P	E	E
	Y	Y	N	Y	N	N	Y	N	Y	N
	Y	Y	Y	Y	No list	No list	N/A	N/A	N/A	N/A
	P	P	P	A or P	P	A	P	P	A	P
	Fast Track	Fast Track	N	N	Encouraged	Encouraged	N	N	N	N+
	51%	Negot	51%	51%	51%	51%	51%	51%	51%	51%
	Y	N	N	N	Y	Y	N	Y	N	Y
	Oct	Oct/May	Jan	Oct	Sept	Jan	Feb	Mar	June	Mar/Oct
	Jan	Jan/Aug	April	Jan	Nov	Apr/Aug/Dec	May	May	Aug	June/Jan
	May	May/Dec	Aug	June	Varies	Varies	Oct	July	Nov	Dec/July
	N	N	Y	N	N	Y	N	N	N	N
	36%	14%	20%	25%	20%	27%	6%	8 to 10%	18%	15%
	53%	53%	36%	50%	55%	39%	50%	30 to 40%	40%	50%
	W	W	Auto	O/W	W	Auto	W	W	E	Auto
	W	O/W	O/W	W	O/W	W	W	W	E	W

EnvirotechNews

CEIT's free monthly listserve, EnvirotechNews, contains information on government funding opportunities, technology opportunities, future needs, Environmental Technology Verification (ETV) opportunities, and upcoming events. To subscribe, send an email to listserver@unixmail.rtpnc.epa.gov with no subject line; the body of the message must only contain: subscribe envirotech news [your first name] [your last name].

If you would like to know more about CEIT services or events, please contact
Maggie Theroux,
Carol Kilbride or
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1-800-575-**CEIT** (2348) or
617-918-1783.

State Economic Development Contacts

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Phone: 802-828-5233
Fax: 802-828-3258
email:ccarter@dca.state.vt.us

Federal Agency SBIR/STTR Program Contact Information

Each participating federal agency administers its SBIR/STTR program differently. Each has its own priorities and areas of focus. The following lists provide general and participating agency contact information. The National SBIR Conference Center is a particularly good source of consolidated resource information. The web site of the participating agencies provides additional information on the agency's SBIR/STTR program from which you can download current solicitations.

General Contact Information

Small Business Administration (SBA)

Web Site: www.sbaonline.sba.gov/SBIR/
Phone: 202-205-6450

National SBIR Conference Center

Web Site: www.zyn.com/sbir/
Phone: 360-683-5742
E-Mail: sbir@zyn.com

Agency Contact Information

DOC, NOAA, SBIR/ORTA

Web Site: www.rdc.noaa.gov/~amd/sbir.html
Phone: 301-713-3565
E-Mail: joseph.bishop@noaa.gov

NIST

Web Site: www.nist.gov/sbir
Phone: 301-975-4517
E-Mail: sbir@nist.gov

DOD

Web Site: www.acq.osd.mil/sadbu/sbir/
Phone: 866-216-4905
E-Mail: SBIRHELPDESK@pbcinc.com

Air Force

Web Site: www.afrl.af.mil/sbir/index.htm
Phone: 800-222-0336
E-Mail: sbir-hq@afrl.af.mil

Agency Contact Information (Cont.)

Army

Web Site: www.aro.army.mil/arowash/rt/
Phone: 703-617-7425
Email: aro-sbir@hqamc.army.mil

BMDO

Web: www.winbmdo.com
Phone: 703-697-3699, 703-697-3694

DARPA

Web Site: www.darpa.mil/sbir/

Navy

Web Site: www.onr.navy.mil/sci_tech/industrial/sbir_bbs/
Phone: 703-696-8528, 703-696-0342
E-Mail: Schapev@onr.navy.mil
Williajr@onr.navy.mil

NIMA

Web Site: www.nima.mil/poc/contracts/sbir/sbir.html
Phone: 301-227-7508
E-Mail: sbir@nima.mil

SOAC

Web Site: soal.socom.mil/smallbus04.htm
Phone: 813-828-6593
E-Mail: dilkg@socom.mil

DOE

Web Site: sbir.er.doe.gov/sbir/
Phone: 301-903-1414
E-Mail: sbir-sttr@science.doe.gov

Agency Contact Information (Cont.)

DOT

Web Site: www.volpe.dot.gov/sbir/
Phone: 617-494-2051
E-Mail: henebury@volpe.dot.gov

ED

Web Site: www.ed.gov/offices/OERI/SBIR/
Phone: 202-219-2004
E-Mail: Lee_Eiden@ed.gov

EPA

Web Site: es.epa.gov/ncerqa/sbir/
Phone: 800-490-9194

HHS NIH

Web Site: www.nih.gov/grants/funding/sbir.htm
Phone: 301-435-2688
E-Mail: sbirsttr@peacetech.com
E-Mail: jg128w@nih.gov

NASA

Web Site: sbir.nasa.gov
Phone: 301-286-8888
202-358-0077
E-Mail: sbir@reisys.com

NSF

Web Site: www.eng.nsf.gov/sbir/
Phone: 703-306-1390
E-Mail: sbir@nsf.gov

USDA

Web Site: www.reeusda.gov/sbir
Phone: 201-401-4002
E-Mail: ccleland@reusda.gov, psb@reusda.gov

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